

REMARKS

The Office Action dated May 9, 2006 and the Advisory Action dated August 10, 2006 have been received and carefully considered. In this response, claims 1, 14, 21, and 23 have been amended. Entry of the amendments to claims 1, 14, 21, and 23 is respectfully requested. Reconsideration of the outstanding rejections in the present application is also respectfully requested based on the following remarks.

I. THE NOTICE OF NONCOMPLIANCE REGARDING CLAIM LISTING

A Notice of Noncompliance was issued with the Advisory Action, asserting that "a complete listing of all the claims is not present" in the prior amendment filed on July 10, 2006. The Examiner asserts that Applicants' way of providing the listing of claims in an appendix section is not compliant with the PTO rules and may lead to confusion and unnecessary delays. Applicants respectfully disagree.

Applicants believe that the prior amendment was in complete compliance with 37 C.F.R. § 1.121, including specifically 37 C.F.R. § 1.121(c), which requires:

"The claim listing shall commence on a separate sheet of the amendment document and the sheet(s) that contain the text of any part of the claims shall not contain any other part of the amendment."

Other than the above-quoted requirement, 37 C.F.R. § 1.121 does not dictate a specific format to follow. Based on reason and experience, Applicants believe that it is permissible (i.e., neither confusing nor likely to cause delay) to include the listing of claims in the appendix section.

In view of the foregoing, it is respectfully that the aforementioned Notice of Noncompliance be withdrawn.

II. THE ANTICIPATION REJECTION OF CLAIMS 1-10, 13-15, AND 23-25

On page 3 of the Office Action, claims 1-10, 13-15, and 23-25 were rejected under 35 U.S.C. § 102(e) as being anticipated by Green et al. (U.S. Patent Application Pub. No. 2003/0167380, hereinafter "Green"). This rejection is hereby respectfully traversed.

Regarding claim 1, the Examiner asserts that Green teaches a storage management system that "copies, prior to execution of each write command, old data present at the at least one unit of storage into the at least one data store" (emphasis added).

Applicants respectfully submit that Green fails to disclose or suggest the copying of old data prior to execution of each write command. To further clarify the patentable distinction, Applicants have amended claim 1 which now recites, among other things, "wherein the storage management system automatically intercepts all write commands issued to the plurality of units

of storage." Green does not teach or suggest automatically intercepting all write commands as presently claimed.

Once implemented, a storage management system according to the claimed invention will perform copy-on-write (COW) operations in response to each and every write command, so that the old data from these individual COW operations can enable a data restoration or recovery to any point in time since the implementation of the storage management system.

Green, however, can only restore data to limited points in time when snapshots were taken. Green lacks the capability to restore data to any point in time because it does not record every change made to the storage system. It is worth noticing that Green relies on pre-scheduled snapshots to back up data for the storage system. See, Figures 14-16 and paragraph [0122]. Alternatively, "a snapshot is periodically 'taken' so that a computer system can be restored in the event of failure." Paragraph [0049] (emphasis added). Since Green does not capture all the write commands directed to the storage system, its data restoration capability is limited. When multiple write commands are directed to the same storage unit within a short period of time between two snapshots, Green's system cannot capture all of those write commands. Indeed, in the time-point-by-time-point analysis of Figure 3 (paragraphs [0064]-[0073]), Green

acknowledges that data "H" between the second and third snapshots is lost. "Because address 4 of the volume changed twice between snapshots, only the starting and ending value of this address are captured by the snapshots." Paragraph [0069].

Green also fails to teach or suggest "wherein a record of the old data is timestamped" as recited in claim 1. Green does not teach timestamping each record of the old data overwritten in response to a write command. It is true that Green speaks of "copy on write." Paragraph [0067]. Despite the use of the same term, the so-called "copy on write" disclosed in Green is quite different from the copy on write described in the present application.

First, Green's "copy on write" is conditional and not performed in response to each and every write command. Rather, the old data about to be overwritten is copied if, and only if, it was in the volume when a previous snapshot was taken. *See*, paragraph [0069].

Second, Green's "copy on write" operations do not record timestamps, and, even if they did, such timestamps would be discarded as soon as a snapshot cache is "permanently fixed." The timeline in Figure 3 is provided to facilitate a time-point-by-time-point illustration. Green does not teach that each of the data copied to the snapshot caches has its own timestamp.

The snapshot specific cache grids 342, 344 and 346 are just one way of illustrating the changes of content in those snapshot caches. See, paragraph [0061]. The real content of each snapshot cache is shown in table 360 in the lower left corner of Figure 3. See also, paragraphs [0062]-[0063]. In table 360, each granule value has a corresponding "Address" and "Snapshot No." Because Green cannot and does not even attempt to restore data to any point in time other than the snapshot time points, it is unnecessary for Green to provide a timestamp for old data backed up in each "copy on write."

It should have become clear now that Green uses "copy on write" only as an intermediate step in preparation for each snapshot. Such "copy on write" operations are conditional, have no individual timestamps, and are collapsed into the snapshots as soon as the snapshot caches are permanently fixed.

In the Advisory Action, the Examiner asserts that, with respect to the time interval between Time 1 and Time 11 (as illustrated in Figure 3 of Green), each record of old data is timestamped. This argument circumvents the point of contention by improperly focusing on only a selected portion of the timeline. In reality, a continuous data protection (CDP) system, whether as described in Green or as presently claimed, typically operates over an extended period of time. It might be

true that, during a short enough time interval, every write command is captured and the related data timestamped. However, as long as pre-scheduled snapshots are used, as in Green, only some but not all write commands can be captured, because I/O requests in a practical storage system cannot be accurately predicted.

It is believed that the distinctions described above set claim 1 apart from Green. Green cannot anticipate claim 1 because Green fails to teach or suggest all the elements recited in claim 1.

Regarding claim 14, the Examiner asserts that the method claimed therein is similarly disclosed by Green as discussed above in reference to claim 1. Applicants have amended claim 14 to clarify that "all write commands issued to the storage system" are automatically intercepted. It is believed that claim 14, as amended, is patentable over Green for at least the same reasons why claim 1 is patentable.

Regarding claim 23, the Examiner asserts that the computer readable medium claimed therein is similarly disclosed by Green as discussed above in reference to claim 1. Applicants have amended claim 23 to clarify that old data are copied "each time immediately before a storage unit is overwritten with new data and without pre-scheduling." It is believed that claim 23, as

amended, is patentable over Green for at least the same reasons why claims 1 and 14 are patentable.

Since claims 2-13 and 26-27 all depend from claim 1, claims 15-20 and 28 all depend from claim 14, and claims 24-25 and 29 all depend from claim 23, these dependent claims should be patentable over Green for at least the same reasons.

In view of the foregoing, it is respectfully requested that the aforementioned anticipation rejection of claims 1-10, 13-15, and 23-25 be withdrawn.

III. THE OBVIOUSNESS REJECTION OF CLAIMS 11, 12, 21, 22, 16-20, AND 26-29

On page 7 of the Office Action, claims 11, 12 and 16-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Green in view of "UNIX In A Nutshell" by Daniel Gilly and the staff of O'Reilly & Associates, Inc. (hereinafter "Gilly"). On page 9 of the Office Action, claims 21, 22 and 26-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Green in view of Applicant's Admitted Prior Art (hereinafter "AAPA").

It is believed that these obviousness rejections have become moot in view of the deficiencies of the primary reference Green as discussed above. Since none of the additional references teach or suggest the claim elements that Green fails

to disclose, the combination of Green with these references cannot render any of the pending claims obvious.

In view of the foregoing, it is respectfully requested that the aforementioned obviousness rejection of claims 11, 12 and 16-20 be withdrawn.

IV. CONCLUSION

In view of the foregoing, it is respectfully submitted that the present application is in condition for allowance, and an early indication of the same is courteously solicited. The Examiner is respectfully requested to contact the undersigned by telephone at the below listed telephone number, in order to expedite resolution of any issues and to expedite passage of the present application to issue, if any comments, questions, or suggestions arise in connection with the present application.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0206, and please credit any excess fees to the same deposit account.

Respectfully submitted,

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